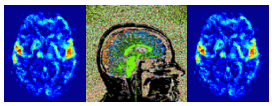

JACOB M. LEVENSTEIN

National Institutes of Health • University of Oxford • (+1) 860-906-2237 • Jacob.Levenstein@nih.gov

ACADEMIC QUALIFICATIONS

Doctor of Philosophy (DPhil) in Biomedical Sciences Oct. 2016 – April 2021
University of Oxford, Corpus Christi College, Oxford, England.
Wellcome Centre for Integrative Neuroimaging (WIN - FMRIB)
Section on Functional Imaging Methods (sFIM), National Institutes of Health (NIH)

- Fellowship Awardee: National Institutes of Health Oxford-Cambridge Scholar Fellowship
  Accelerated and Individualized Doctoral Training Program
- Thesis title: *Neurochemical and Structural Brain Imaging of Human Motor Control in Health and Post-Stroke (Submitted, November 2020)*

Mentors:
Professor Charlotte J. Stagg, University of Oxford
Dr. Peter A. Bandettini, National Institutes of Health

Fields of Study: *Human Neuroimaging, Magnetic Resonance Imaging (MRI), Neurophysiology, Magnetic Resonance Spectroscopy (MRS), Neuropsychology, Clinical Imaging of Stroke*

Master of Science (MSc) in Psychological Research Oct. 2014 – Oct. 2015
University of Oxford, Corpus Christi College, Oxford, England
Department of Experimental Psychology

- Dissertation [awarded distinction]
  Title*: Effects of Brain Stimulation on Cortico-Hippocampal Functional Connectivity and links to Mathematical Processing* - Mentor, Professor Roi Cohen Kadosh
- Mini-Research Project:
  Title: *Self-Prioritization and Physiological Response Bias* - Mentor, Professor Glyn Humphreys

Bachelor of Arts (BA): Individually-designed Major in Cognitive Studies
Minors in *Philosophy* and *International Studies* Sept.2008 – May 2012
Endicott College, Beverly, Massachusetts, United States
Graduated with Honors (*Magna Cum Laude*), GPA: 3.77/4.00

- Thesis*: Prioritized Perception and Synaesthesia* Sept. 2011 – May 2012
  Independently designed and conducted global vs. local visual processing experiment to assess perceptual capacities and preferences of grapheme-color synaesthetes
- Independent Study in Comparative Phenomenology Jan. 2011 – April 2012
  Using diagrammatic representations, analyzed cognitive theories relating to the compartmentalization of language, meaning, and emptiness - Mentor, Professor Rocco Gangle

RESEARCH EMPLOYMENT

Oxford Cognitive Neuropsychological Centre June 2015 – Sept. 2016
Department of Experimental Psychology
University of Oxford, Oxford, England

Junior Researcher and Laboratory Manager

- Processed and organized brain imaging and behavioral data
- Supported 20+ member research lab with technical and research-based queries

Research Projects and Data Analysis

- Lesion Symptom Mapping of Stroke and imaging analyses on CT and MRI scans
- Method development for semi-automated brain lesion delineation analysis

Massachusetts General Hospital, Harvard Medical School Sept. 2012 – Sept.2014

Department of Neurology and Psychiatry
Athinoula A. Martinos Center for Biomedical Imaging (Martinos Center)
Mood and Motor Control Laboratory, Charlestown, MA, United States

Research Technician

- Acquired and analyzed neuroimaging (MRI) and EMG data
- Operated Siemens TIM Trio 3-Tesla whole-body MRI scanner

Research Projects and Data Analysis

- Spatial and Amplitude Variance in Dystonic fMRI Activation
- Temporal Dynamics of the Basal Ganglia in Focal Dystonia

Indiana University, Department of Psychology and Brain Sciences Sept. – Dec. 2011

Computational Cognition and Learning Laboratory, Directed by Professor Chen Yu
Bloomington, Indiana, United States

Research Assistant & Visiting Scholar

- Semester Internship, 32 hours per week

Research Projects and Data Analysis

- Scheduled 12 – 18-month-old participants for social interaction and language learning experiments
- Processed and coded eye-tracking data for the above-mentioned experiments

AWARDS & FELLOWSHIPS

National Institutes of Health Oxford Cambridge Scholars Fellowship

"The National Institutes of Health Oxford-Cambridge Scholars Program is an accelerated, individualized doctoral training program for outstanding science students committed to biomedical research careers" - https://oxcam.gpp.nih.gov/

Awarded in August 2016 through July 2021, this predoctoral fellowship provides full-tuition fees for the University of Oxford, full-time income stipend, healthcare coverage, conference travel and additional funding for research costs

Estimated award amount: $250,000 USD

Travel Grant, Corpus Christi College (Oxford, England)

Awarded £500, March 10th, 2017

Poster Prize, Interpreting BOLD Workshop

Awarded £100, September 11th, 2018

Travel Grant, Corpus Christi College (Oxford England)

Awarded £250, November 26th, 2018

MSc Dissertation awarded a Distinction

Dissertation title: *Effects of Brain Stimulation on Cortico-Hippocampal Functional Connectivity and links to Mathematical Processing*

Endicott College Scholars Program and Scholarship

Accepted students (< 1% of student body) are enrolled into an interdisciplinary honors curriculum. Invitation to apply are restricted to first-year students ranking in the top 5% of their class.

Scholarship awarded: $9000.00 USD

Linda Johnson LeMieux ’58 Scholarship

Awarded $1000 USD in September 2011 to assist with expenses relating to visiting scholar appointment at Indiana University, Department of Psychology and Brain Sciences

TEACHING AND MENTORING

Joint-Mentor — Jan. 2019 – Aug. 2019

Justin Andrushko, PhD Candidate (Kinesiology, University of Saskatchewan) and visiting student (University of Oxford)

- Day-to-day supervision on an MRI research study acquired during Justin’s time in Oxford
- Taught hands-on tutorials covering unix scripting, behavioral data analysis and MRI analysis

Joint-Mentor — Jan. 2018 – April 2018

Freya Marijatta, MSc Neuroscience Student (University of Oxford)

- Day-to-day supervision of MSc dissertation project
- Taught hands-on tutorials covering the basics of fMRI and MRS analysis

MRI Graduate Programme, University of Oxford — October 2018

Course Tutor

- Taught fMRI study design
- Assisted with MRI based queries

MRI Graduate Programme, University of Oxford — October 2017

Course Tutor

- Taught fMRI study design
- Assisted with MRI based queries

Lesion Mapping Workshop (1 Day), University of Oxford — April 2016

- Organized workshop for the Department of Experimental Psychology, University of Oxford
- Presented two hands-on tutorials sessions covering i. lesion delineation and ii. image processing

ACADEMIC COMMITMENTS

Committee Membership and Positions

- NIH OxCam Student Leadership Board — Oct. 2019 – Oct. 2020
  - *Class of 2016 Representative*
- NIH Graduate Student Council — Oct. 2019 – Oct. 2020
  - *OxCAM Student Representative*
- Experimental Psychology Teaching Policy Committee — Oct. 2014 – Oct. 2015
  - *MSc Representative*
- Experimental Psychology Graduate Joint Consultant Committee — Oct. 2014 – Oct. 2015
  - *MSc Representative*
- Iota Gamma Chi: Liberal Studies Honour Society — Jan. 2010 – May 2012
  - President, Endicott College Chapter
- Mortar Board: National Honour Society — Jan. 2011 – May 2011
  - Co-President, Endicott College Chapter
- Sigma Iota Rho: International Studies Honour Society — Jan. 2010 – May 2011
  - President (2012) & Vice-President (2011), Endicott College Chapter

Peer-Reviewer

I have acted as a sole or joint reviewer for the following peer-reviewed journals:

- Neuroimage
- Cerebral Cortex
- Brain Stimulation
- Neuropsychologia
- Journal of Cerebral Blood Flow and Metabolism

PEER-REVIEWED PUBLICATION

Waugh, J. L., Kuster, J. K., Makhlouf, M. L., **Levenstein, J. M.**, Multhaupt-Buell, T. J., Warfield, S. K., ... & Blood, A. J. (2019). A registration method for improving quantitative assessment in probabilistic diffusion tractography. *NeuroImage*, *189*, 288-306.

Blood, A. J., Kuster*, J. K., Waugh*, J. L., **Levenstein*, J. M.**, Multhaupt-Buell, T. J., Sudarsky, R. L., ... & Sharma, N. (2019). White matter changes in cervical dystonia relate to clinical effectiveness of botulinum toxin treatment. *Frontiers in Neurology*, *10*, 265. ** equal contributions*

Johnstone*, A., **Levenstein*, J. M.**, Hinson, E. L., & Stagg, C. J. (2018). Neurochemical changes underpinning the development of adjunct therapies in recovery after stroke: A role for GABA?. *Journal of Cerebral Blood Flow & Metabolism*, *38*(9), 1564-1583. ** equal contributions*

Varjačić, A., Mantini, D., **Levenstein, J.**, Slavkova, E. D., Demeyere, N., & Gillebert, C. R. (2018). The role of left insula in executive set-switching: Lesion evidence from an acute stroke cohort. *cortex*, *107*, 92-101.

Waugh, J. L., Kuster, J. K., **Levenstein, J. M.,** Makris, N., Multhaupt-Buell, T. J., Sudarsky, L. R., ... & Blood, A. J. (2016). Thalamic volume is reduced in cervical and laryngeal dystonias. *PLoS One*, *11*(5), e0155302.

I am acknowledged on these publications:

Jenkinson, M., & Chappell, M. (2018). *Introduction to neuroimaging analysis*. Oxford University Press.

Shalev, N., Humphreys, G., & Demeyere, N. (2016). Assessing the temporal aspects of attention and its correlates in aging and chronic stroke patients. *Neuropsychologia*, *92*, 59-68.

IN PROGRESS PUBLICATIONS

Kuster J. K., **Levenstein J. M.,** Waugh J., Trisha J. Multhaupt-Buell T. J., Lee M. J., Kim B. W., Pagnacco G., Makhlouf M. L., Sudarsky L. R., and Breiter H. C., Sharma, N. Blood, A. J. (under-review) Sustained brain motor function after repetitive finger tapping in cervical dystonia

Levenstein, J. M., Clarke, W., Ip. B., Campbell., J., Emir. U., Bandettini, P.A., Stagg, C.J. (in preparation). Combined fMRI-fMRS reveals temporal dependent task-induced glutamate changes in the human motor cortex

Levenstein, J. M., Andrushko, J. W., Clarke, W., Zich, C., Emir, U., Bandettini, P.A., Stagg, C. J. (in preparation). Multi-Voxel Spectroscopic Imaging reveals spatial variations of task-induced glutamate and GABA changes the across motor cortices

Waugh, J. L., Hassan, A. A. O., Kuster, J. K., **Levenstein J. M.,** Warfield, S. K., Makris, N., Brüggemann, N., Sharma, N., Breiter, H.O., Blood, A. J. (under-review) An MRI Method for Parcellating the Human Striatum into Matrix and Striosome Compartments In Vivo

Bronson, M.B., Dockree, P.M., Harty, S., Pearce, D.J., **Levenstein, J.M.,** Gillebert, C.R., Bellgrove, M.A., O'Connell, R.C., Robertson, I.H., Demeyere, N (under-review) Lost in time: temporal monitoring elicits clinical decrements in sustained attention post-stroke

Nettekoven, C., Brady, S., Clarke, W., Emir, U., **Levenstein, J.M.,** Pititet, P., Johansen-Berg, H., Jenkinson, N., Stagg, J.C (2020). GABA predicts functional connectivity changes and retention in visuomotor adaptation. bioRxiv. https://doi.org/10.1101/2020.12.22.423981

CONFERENCES AND WORKSHOPS

2020

Levenstein, J. M., Clarke, W., Ip, B., Andrushko, J. W., Zich, C., Campbell, J., Emir, U., Bandettini, P. A., Stagg, C. J. (2020). Measuring Temporal and Spatial Neurochemical Changes in the Human Brain. *Medical Research Council (MRC), Brain Network Dynamics Unit (BNDU)***,** Science Day, Hosted online, December 18th, 2020

- **Oral Presentation**

Levenstein, J. M., Clarke, W., Ip, B., Andrushko, J. W., Zich, C., Campbell, J., Emir, U., Bandettini, P. A., Stagg, C. J. (2020). Measuring Temporal and Spatial Neurochemical Changes in the Human Brain. *Global Doctoral Partnerships Annual Workshop***,** Hosted online, June 15th – 17th, 2020

- **Oral Presentation**

Levenstein, J. M., Andrushko, J. W., Clarke, W., Zich, C., Emir, U., Bandettini, P. A., Stagg, C. J. (2020). Multi-Voxel Spectroscopic Imaging at Rest and Task: GABA and Glutamate Across Human Motor Cortices. *Organization for Human Brain Mapping*, hosted online, June 25th – July 3rd, 2020

- **Poster/Video Presentation**

2019

Levenstein, J. M., Webster, M., Bandettini, P. A., Stagg, C. J., Demeyere, N. (2019). Lesion-Symptom Mapping of Acute Motor Deficits. *Wellcome Centre for Integrative Neuroimaging Stroke Workshop*, University of Oxford, England, June 7th, 2019

- **Invited Talk**

Levenstein, J. M., Clarke, W., Ip, B., Campbell, J., Emir, U., Bandettini, P. A., Stagg, C. J. (2019). 7T Combined fMRI-fMRS Multiscale Investigation of the Motor Cortex during Active and Resting States. *Organization for Human Brain Mapping*, Rome, Italy, June 9th – June 13th, 2019

- **Poster Presentation**
- **Oral Presentation**

Levenstein, J. M., Clarke, W., Ip, B., Campbell, J., Emir, U., Bandettini, P. A., Stagg, C. J. (2019). 7T Combined fMRI-fMRS Multiscale Investigation of the Motor Cortex during Active and Resting States. *Global Doctoral Partnerships Annual Workshop,* Oxford, England, June 26th – 27th, 2019

- **Poster Presentation**

Levenstein, J. M., Clarke, W., Ip, B., Campbell, J., Emir, U., Bandettini, P. A., Stagg, C. J. (2019). 7T Combined fMRI-fMRS Multiscale Investigation of the Motor Cortex during Active and Resting States. *National Institutes of Mental Health Training Day*, D.C., United States, September 16th, 2019

- **Poster Presentation**

Levenstein, J.M., Clarke, W., Ip, B., Campbell, J., Emir, U., Bandettini, P. A., Stagg, C. J. (2019). 7T Combined fMRI-fMRS Multiscale Investigation of the Motor Cortex during Active and Resting States. *Society for Neuroscience,* Chicago, United States, Oct. 19th – 23rd, 2019

- **Poster Presentation**

2018

Marijatta, F., **Levenstein, J. M.,** Emir, U., Stagg, C. J. (2018). Combined fMRI-fMRS at 7T: Examining the Neurochemistry of the BOLD Signal During Movement. *Oxford Neuroscience Symposium*, University of Oxford, England, March 21st, 2018

- **Poster Presentation**

Levenstein, J. M., Ip, B., Campbell, J., Emir, U., Bandettini, P. A., Stagg, C. J. (2018). 7T combined fMRI-fMRS study of neurochemical changes during movement in left motor cortex. Organization for Human Brain Mapping, Singapore, June 17th – June 21st, 2018

- **Poster Presentation**

Levenstein, J. M., Ip. B., Campbell, J., Emir, U., Bandettini, P.A., Stagg, C. J. (2018). 7T combined fMRI-fMRS study of neurochemical changes during movement in left motor cortex. Global Doctoral Partnerships Annual Workshop**,** Cambridge, England, July 16th – 18th, 2018

- **Poster Presentation**
- **Oral Presentation**

Levenstein, J.M., Ip. B., Campbell, J., Emir, U., Bandettini, P. A., Stagg, C. J. (2018). 7T combined fMRI-fMRS study of neurochemical changes during movement in left motor cortex. Interpreting BOLD II: a dialogue between cellular and cognitive neuroscience, Oxford, England, September 9th – 11th, 2018

- **Poster Presentation**
- **Awarded Poster Prize**

2017

Levenstein, J. M., Varjacic, A., Mantini, D., Gillebert, C., Bandettini, P. A., Stagg, C. J., Demeyere, N. (2017). Clinical Acute Stroke Imaging of Motor Deficits using VLSM and White Matter Tract Based Analyses. *British Neuroscience Association*, Birmingham, England, April 10th – 13th, 2017

- **Poster Presentation**
- **Oral Presentation**

Levenstein, J. M., Varjacic, A., Mantini, D., Gillebert, C., Bandettini, P.A., Stagg, C. J., Demeyere, N. (2017). Clinical Acute Stroke Imaging of Motor Deficits using VLSM and White Matter Tract Based Analyses. *Organization of Human Brain Mapping,* Vancouver, Canada, June 25th – 29th, 2017

- **Poster Presentation**

Varjacic, A., Mantini, D., **Levenstein, J. M.**, Demeyere, N., Gillebert, C. (2017). Lesion neuroanatomy of set-switching in a large sample of acute stroke patients. *Organization for Human Brain Mapping,*Vancouver, Canada, June 25th – 29th, 2017

- **Poster Presentation**

Levenstein, J. M., Varjacic, A., Mantini, D., Gillebert, C., Bandettini, P. A., Stagg, C. J., Demeyere, N. (2017). Clinical Acute Stroke Imaging of Motor Deficits using VLSM and White Matter Tract Based Analyses. *Global Doctoral Partnerships Annual Workshop*, Maryland, United States, June 20th – 21st 2017

- **Poster Presentation**

Moore, M., Shalev, N, **Levenstein, J. M,** Gillebert, C., Demeyere, N.(2017) Dissociating

Neglect Dyslexia and Visual Neglect Following Stroke. *International Neuropsychological Society Annual Meeting*, New Orleans, United States, February 1st – 4th, 2017

- **Poster Presentation**

2016

Levenstein, J. M. (2016), Practical 1: Introduction to viewing the brain in three dimensions
Lesion Symptom Mapping Workshop, Oxford, England, April 19th, 2016

- **Organiser**
- **Oral Presentation**

Levenstein, J. M. (2016), Practical 2: Lesion Delineation and Image Processing
Lesion Symptom Mapping Workshop, Oxford, England, April 19th, 2016

- **Organiser**
- **Oral Presentation**

TRAININGS, CERTIFICATIONS AND TECHNICAL SKILLS

Trainings

- Teaching and Learning Skills Part I: tutorial and small group teaching — October 2015
  University of Oxford Medical Science Division
- MRI Graduate Programme, University of Oxford — Oct. 2016 – June 2017
  Graduate level training courses covering the physics and analysis of MRI data. Course mark: 85.3%
- Analysis of Functional Neuroimages (AFNI) Bootcamp — Nov. 4th – 8th, 2019
  Bethesda, United States
- Organization for Human Brain Mapping Educational Courses — July 13th, 2020
  Online
- Organization for Human Brain Mapping Educational Courses — June 9th, 2019
  Rome, Italy
- Organization for Human Brain Mapping Educational Courses — June 17th, 2018
  Singapore
- Brain Stimulation and Imaging Methods — June 15th – 16th, 2018
  Singapore
- Organization for Human Brain Mapping Educational Courses — June 25th, 2017
  Vancouver, Canada
- Brain Stimulation and Imaging Methods — June 23rd – 24th, 2017
  Vancouver, Canada
- Neuroplastics Skills Workshops — Oct. 2016 - 2020
  The Neuroplastics group at the WIN host academic trainings including: *i. how to give a research presentation, ii. how to review a manuscript, iii. how to respond to reviewers' comments, iv. resilience training for research, and v. grant writing*

Certifications

- Completed MRI Operator Certification (Martinos Center sponsored, 2012 - 2014)
- Clinical Research Coordinator Certification (MGH sponsored, 2012 - 2014)
- Collaborative Institute Training Initiative CITI (Ethics training MGH, 2012 - 2014)
- MRI Safety Training (MGH: 2012, Oxford: 2015,16,17,17,19, NIH: 2016, 2019)
- Good Clinical Practice (Ethics training Oxford, 2016)
- Universal Precautions (NIH, 2016 – 2020)
- Basic Life Support (NIH: 2016 – 2018, Oxford: 2017)
- Information and Security Management (NIH, 2016 – 2020)
- Information Security Awareness (NIH, 2016 – 2020)

- Privacy Awareness and Records Management Awareness (NIH, 2016 – 2020)
- Secure Remote Computing (NIH, 2016 – 2020)
- Information Security Awareness (Oxford, 2017)
- Seizure Management Training (Oxford, 2017)
- Anti-harassment training (NIH, 2019)
- Anti-discrimination and Retaliation and Prevention of Sexual Harassment (NIH, 2019)
- Your Rights and Responsibilities as an NIH Trainee (NIH, 2020)

Technical Experience

- Proficient in the following MRI analysis toolboxes:
  FSL, Freesurfer, AFNI, SPM, LCmodel, MRIcron, NPM, ClinicalToolBox, Tractotron, Disconnectome, VLSM

- Proficient in the following scripting languages/software programs
  Unix (bash & tcsh), MATLAB, R, Presentation, SPSS, GraphPad, JASP, Excel

- Proficient in acquiring and analyzing the following forms of data:
  MRI scans, physiological recordings (i.e., heart rate, pulse ox, respiration), EMG, eye-tracking, motion sensors, response box, force transducers, Magnetic Brain Stimulation (TMS), Transcranial Electric Stimulation (tES), PACS, clinical images and clinical assessments